Series 2000

CPS®

INSTRUCTION MANUAL

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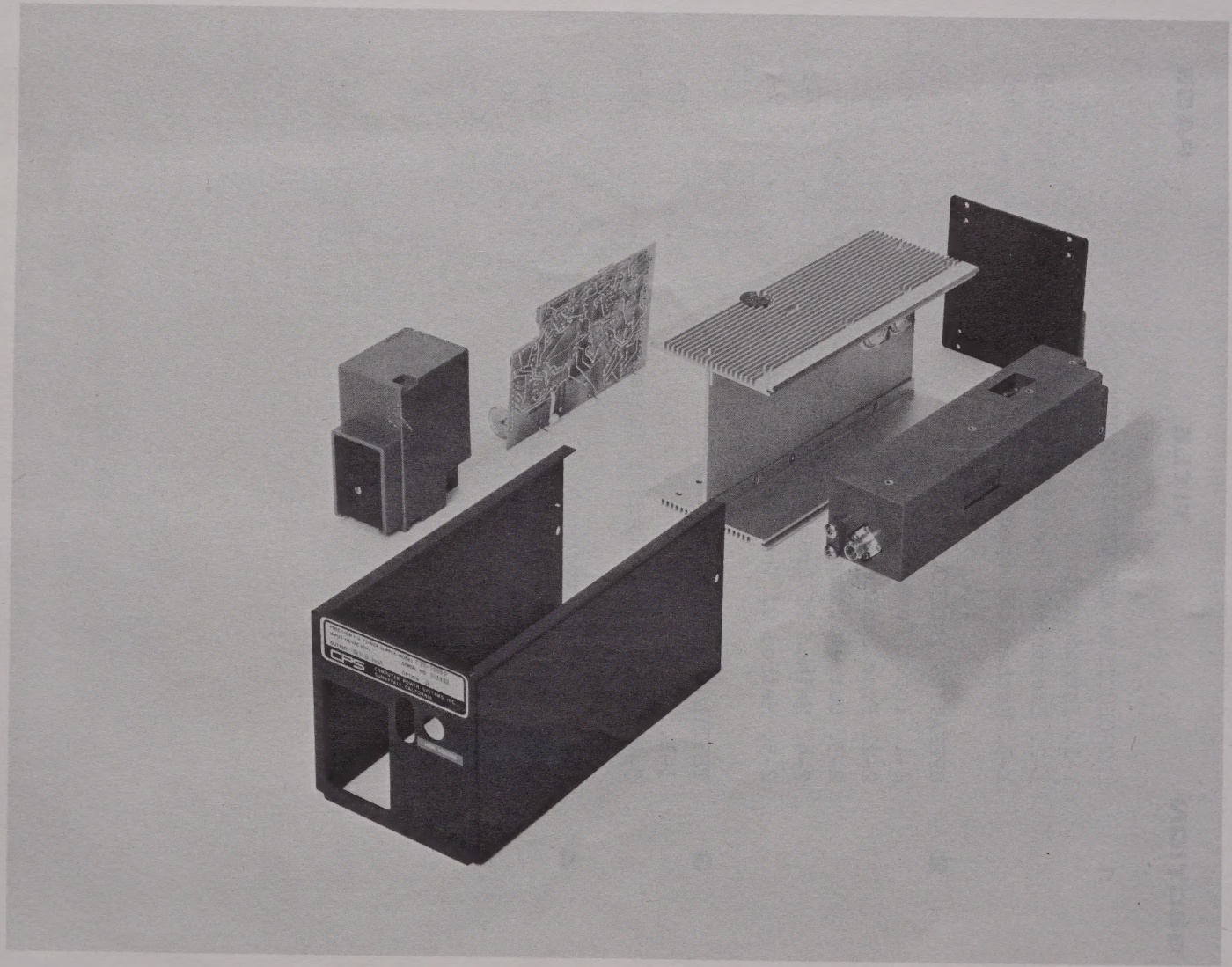
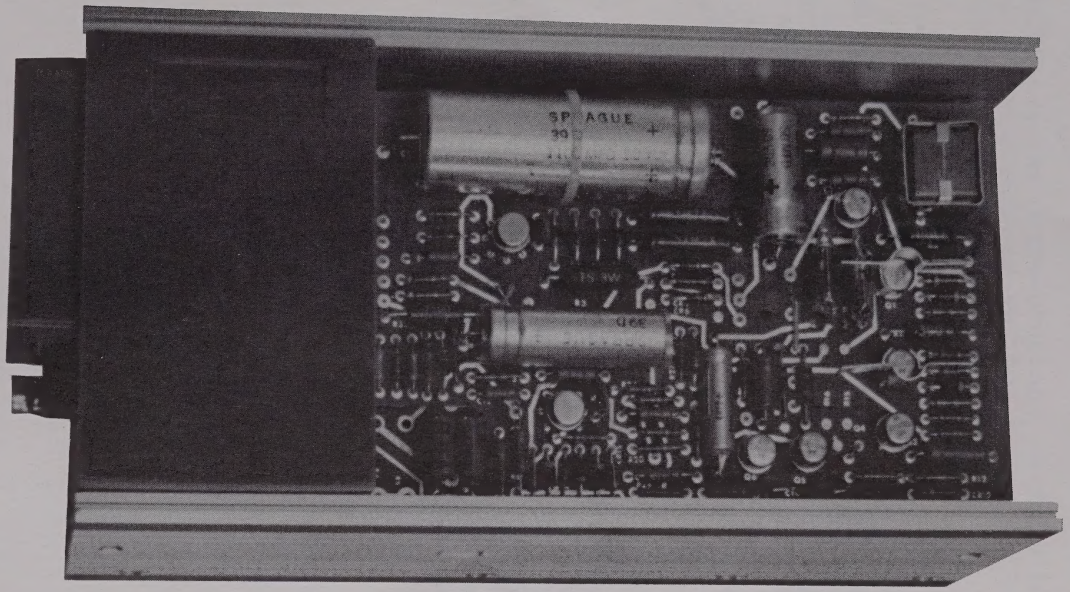



SPRAGUE

SECTION 1

INTRODUCTION & SPECIFICATION

1.1 INTRODUCTION:

The CPS-2000 series Ultra-precision High Voltage Power Supplies are available in various Single output models sa specified on Table 1, Page 2.

The 2000 series offers ultra-precision high voltage in the same compact package as the 1000 series high voltage supplies. The 2000 series has many production and laboratory applications such as supplying power to nuclear detectors and photomultiplier tubes. It is also an excellent electrostatic focus or grid supply for precision CRT display systems, flying spot scanners and computer output microfilm systems.

The 2000 package is compact and the high voltage circuitry is encased in epoxy. This excellent insulation material permits size reduction of the high voltage section. There is no exposed high voltage,and therefore shock hazard is minimum. The high voltage block plugs into one parent board so that unreliable point-to-point wiring is eliminated and mechanical reliability is greatly increased. The low voltage section is uncast and repairable.

All CPS Power Supplies are acoustically silent, because the internal oscillator circuits operate near 25K HZ.

1.2 ELECTRICAL SPECIFICATION:

Output Voltage: Fixed with 10% vernier adjustment (customer to specify end voltage points within specified limits).

Output Protection: Completely short circuit proof. Self-restoring after short removal.

Regulation: 0.001% for line or load variations over the operating range.

Stability: Less than .005% drift in output voltage per hour; less than .01% drift per 8-hour period (at constant ambient temperature after 4-hour warm-up).

Repeatability: 0.01% (after warm-up).

Temperature Coefficient: 25 parts per million per ^{o}C in ambient (after warm-up).

Temperature Ranges: Operating ($0^{o}C$ to + $50^{o}C$);

Input: 105-125 Volts, 47-440Hz.

TABLE 1

MODEL	VOLTAGE-KV	CURRENT-MA	RIPPLE PK-PK
			.020V ~~.002V~~
2500 (P or N)	.5 to 2	5.0	
2100 (P or N)	.5 to 3	3.0	.002V
2200 (P or N)	2 to 5	2.0	.020V

PER WIRE 10-15-76 CPS INC
TELEX # 2326

OPTIONS: A - Provides twice the output current of the standard unit. The hight increases to 5 3/4" (14.6 cm)

E - Extends the 10% Vernier Adjustment to any desired range between 0 and full output.

F - The high volt ground return designated "Circuit Common" is isolated from earth or chassis ground in order to measure power supply output current or minimize system ground loops. Output current may be measured by using a low impedance meter. The load regulation is affected by this meter resistance as the voltage drop across the current meter is added to the output voltage. The current meter requires the low end of the high voltage load be connected to the output connector shield. In the situation where option F is being used to minimize system ground loops, the low end of the high voltage load is connected directly to C. Com. A complete DC isolation between ground and C. Com. exists up to a clamping potential of $\pm$ 80 V.

R - Provides a receptacle for the CPS series RPA remote programming accessories. Supplies can be either voltage or resistance programmed.

1.3 MECHANICAL SPECIFICATION:

Output Terminals: Special CPS mating connector (06-015) furnished

Mounting: The series 2000 can be mounted on the top, bottom and rear. The rear mounting is by four 8/32 screws. Input, output, monitor terminals, and fuse are mounted on the front. The internal adjustment is available through a hole in the top panel.

Size: See Fig. 1

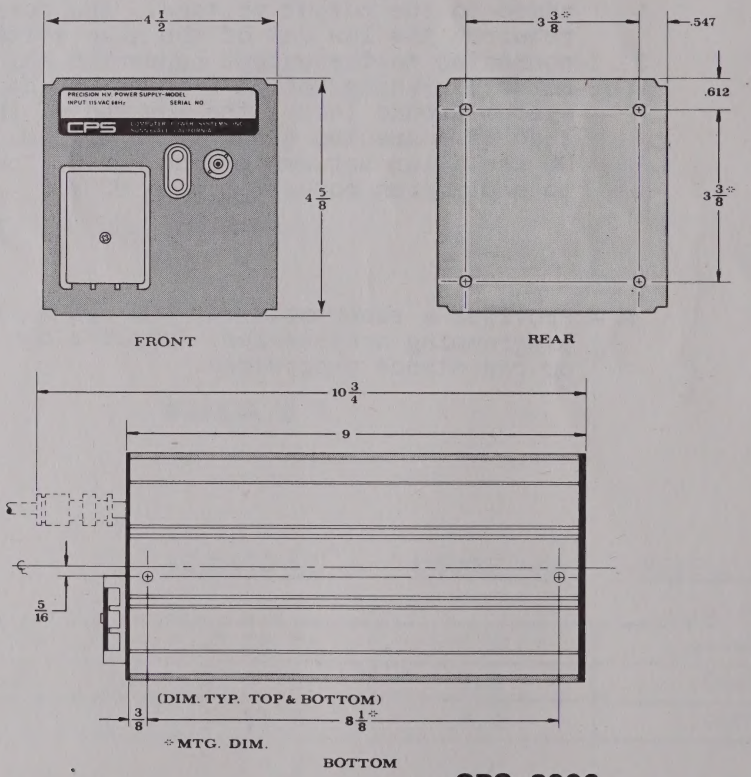


Fig. 1

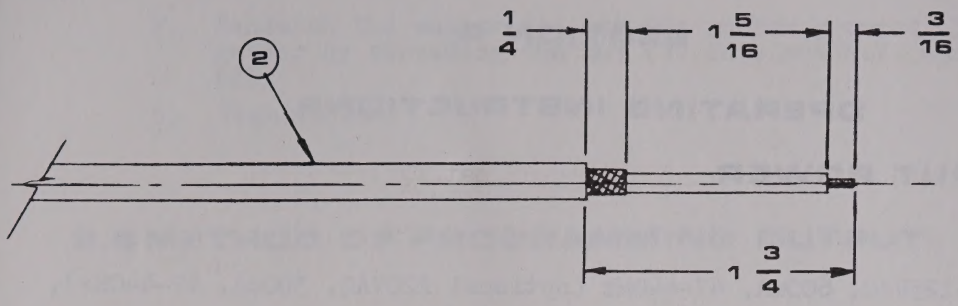


Fig. 3

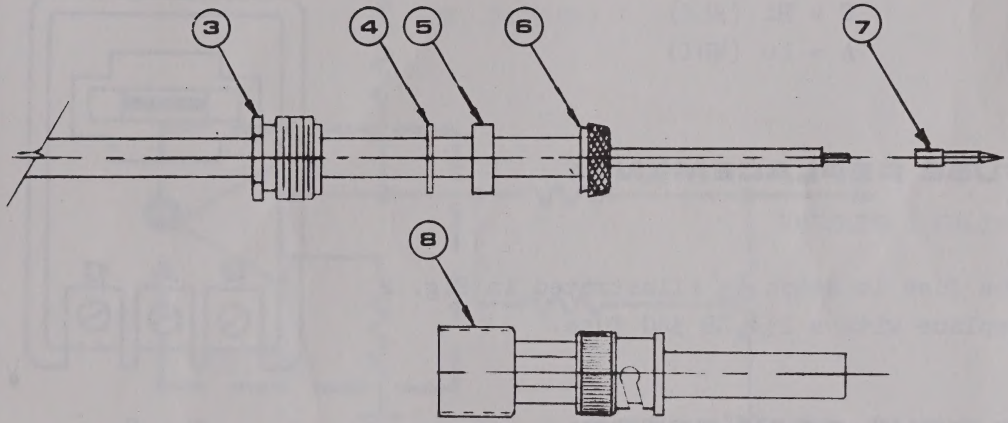


Fig. 4

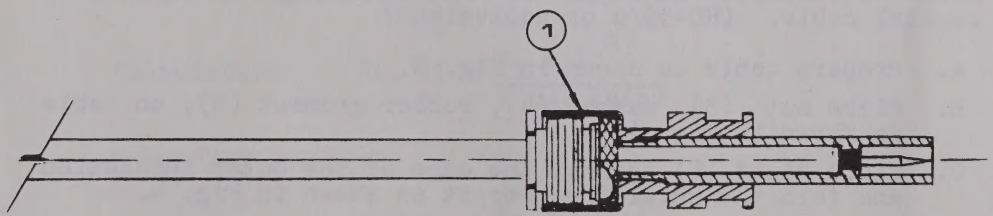


Fig. 5

FIG 2.1

SECTION 2

OPERATING INSTRUCTIONS

2.1 INPUT POWER

105-125VAC, 600mA, 47-440Hz (optional 220VAC, 300mA, 47-440Hz).

The input power is connected to the supply as illustrated in Fig. 2.

Terminal: G = earth ground (GRN)
C = Hi (BLK)
A = Lo (WHT)

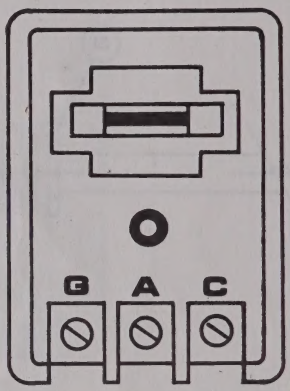


Fig. 2

2.2 FUSE REPLACEMENT:

The fuse location is illustrated in Fig. 2
Replace with a 1½A SB 3AG fuse.

2.3 OUTPUT CONNECTOR:

Assemble connector in steps listed below using high voltage coaxial cable. (RG-59/u or equivalent)

A. Prepare cable as shown in Fig. 3.

B. Place nut (3), washer (4), rubber grommet (5), on cable as shown in Fig. 4.

C. Place gland (6) against the edge of the outer insulation and fold the shielding over it as shown in Fig. 4.

D. Insert the inner conductor in the small hole in the H.V. contact (7) and solder. Conductor support should slide freely over H.V. contact and RG-59/u insulation after soldering.

E. Push the cable through the H.V. connector (8) until the gland (6) is seated in the hole.

F. Sandwich the washer (4) and the rubber grommet (5) together by threading the nut (3) into the H.V. connector (8).

G. Tighten nut

2.4 METHOD OF PROGRAMMING OUTPUT:

The CPS-2000 series is programmed by resistors R_1, R_4, (R_2)(R_5) which are located on the MOTHER BOARD. See Figs. 6 and 7.

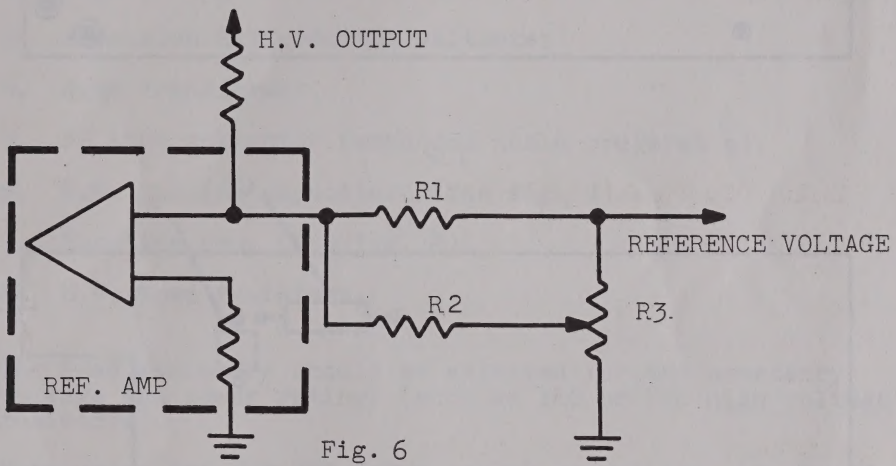


Fig. 6

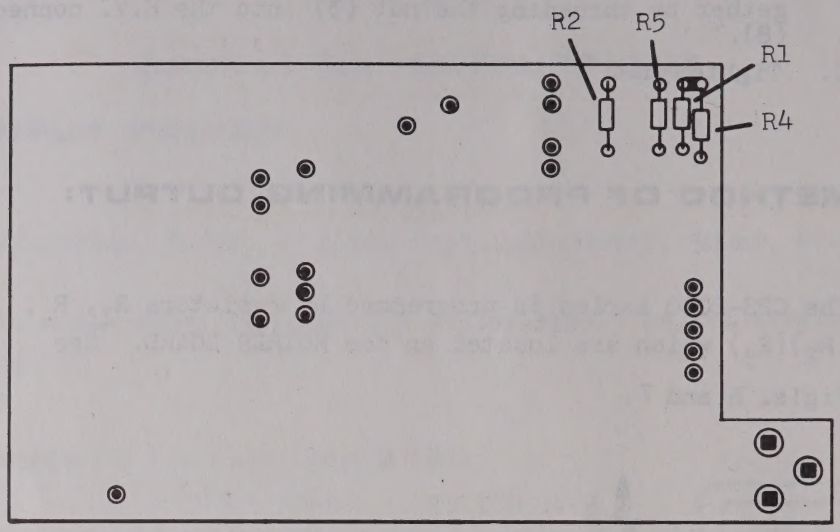
The general rule to remember is that as R_1 increases, V out (high voltage) decreases.

Calculation: $$R_4, R_5 = \frac{K_1 \times 10^6}{V \text{ out (min)}}$$

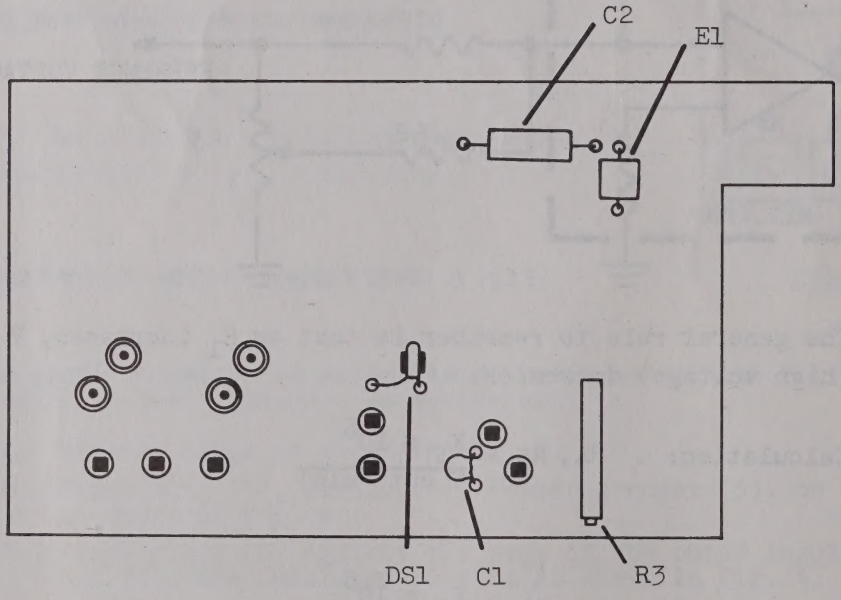
$$R_1, R_2 = \frac{K_2 \times 10^6}{V \text{ out (max)}} - V \text{ out (min)}$$

Where:

	K_1	K_2
500V - 2KV	38	34
2KV - 5KV	120	106
500V - 3KV	58	50



TOP



BOTTOM

Fig. 7 OUTPUT VERNIER ADJUSTMENT

V out (min) = lowest desired high voltage output
V out (max) = highest desired high voltage output

Warning: Do not exceed rated output more than 5%.

2.5 METHOD OF TESTING H.V. SUPPLY:

Testing the high voltage power supply will require the list of equipment shown below:

1. Oscilloscope.
2. High voltage divider probe, CPS-HVP-250 or equivalent.
3. Precision differential voltmeter.
4. Auto transformer.
5. AC line voltmeter (expanded scale preferable).
6. H.V. viewing capacitor. (See fig. 9).
7. Shorting rod. (See fig. 8).
8. H.V. load resistors.

The load resistors should be selected for the necessary voltage and power ratings (such as IRC or RPC high voltage resistors).

When using the HVP-250 probe or any equivalent, it should be considered as a parallel load. The impedance of the HVP-250 is 250 MEG ohms.

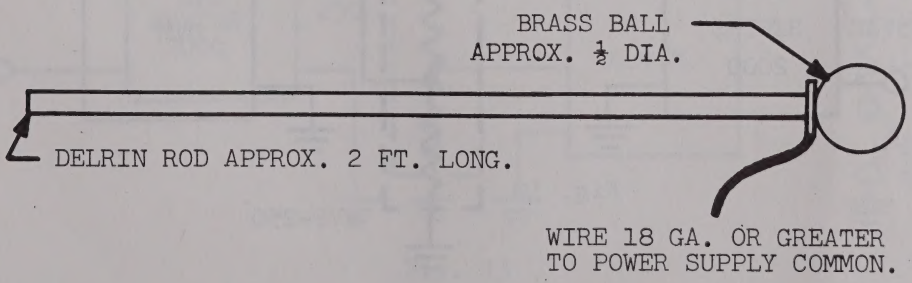


Fig. 8

When making a ripple measurement, a viewing capacitor can be made up as shown schematically in Fig. 9.

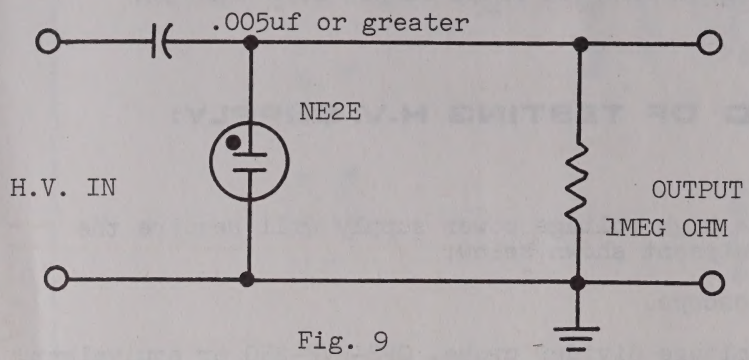


Fig. 9

The voltage rating of the capacitor must meet or exceed the H.V. output of the supply.

HIGH VOLTAGE MEASUREMENT:

Using the CPS HVP-250 divider probe or equivalent, apply 115VAC input power. After warm-up the output voltage can be measured with a differential voltmenter.

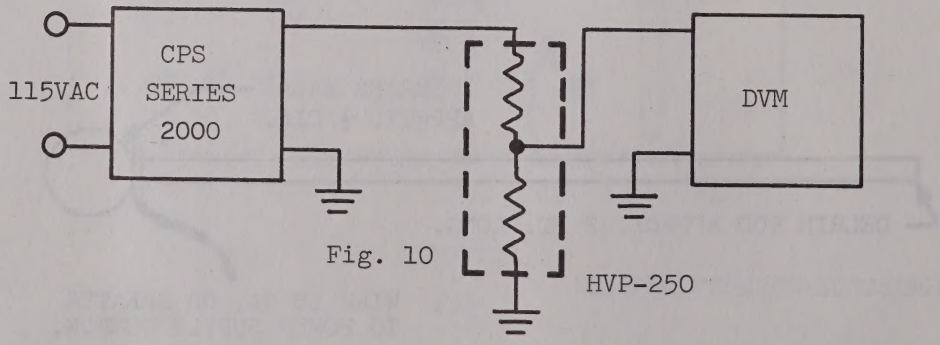


Fig. 10

LINE REGULATION TEST:

With full load applied, use an auto transformer to vary input line voltage between 105VAC and 125VAC. Note the change in output. The H.V. output of power supply should have less than .001% change from 105VAC to 125VAC.

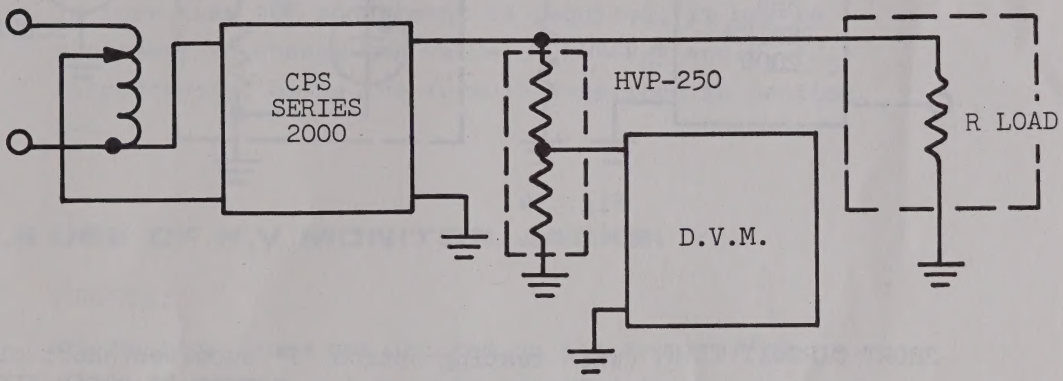


Fig. 12

LOAD REGULATION TEST:

With load connected as illustrated in Fig. 13, use shorting rod connected to ground and touch low end of resistor load. The output voltage change should not exceed .001%.

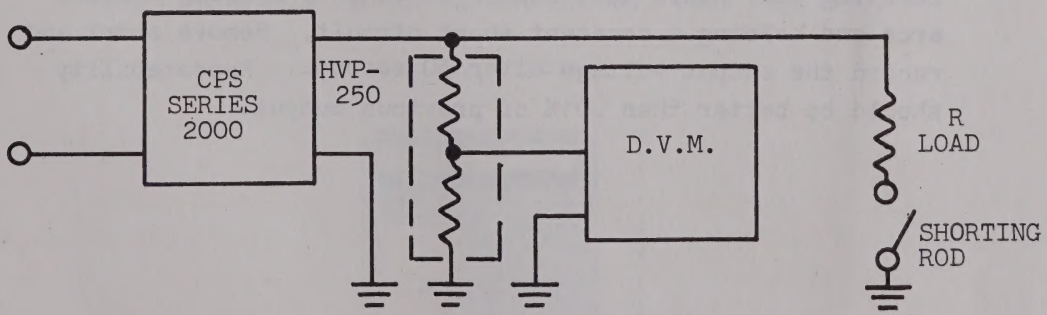


Fig. 13

OUTPUT RIPPLE TEST:

Ripple can be measured by using the H.V. viewing capacitor and an oscilloscope Fig. 14. The output ripple should not exceed ~~200mV~~ 20 MV peak to peak.

PER WIRE 10-15-6 CPS, INC TELEX #23

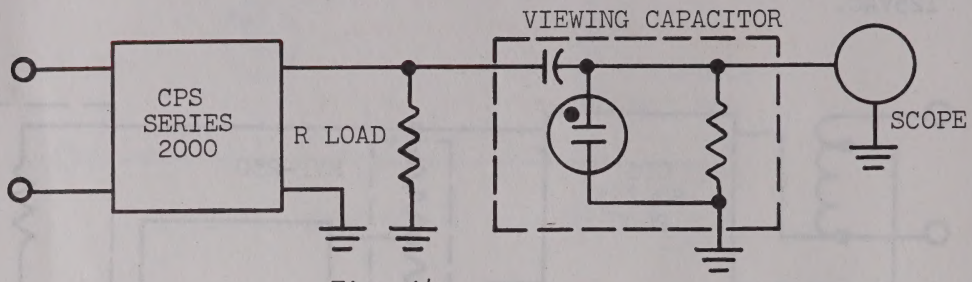


Fig. 14

SHORT CIRCUIT TEST: (When testing option 'F' supplies; short circuit common to earth ground)

CAUTION:

Disconnect oscilloscope from viewing capacitor while performing this test.

Using a differential voltmeter connected to HVP-250 DIVIDER PROBE or equivalent, record output of supply. Short the output of the power supply to ground using a shorting rod. This test should be done by drawing several arcs and holding a constant short circuit. Remove short and record the output voltage after 30 seconds. Repeatability should be better than .01% of previous output.

SECTION 3

TESTING HIGH VOLTAGE SUPPLY

3.1 CALIBRATION:

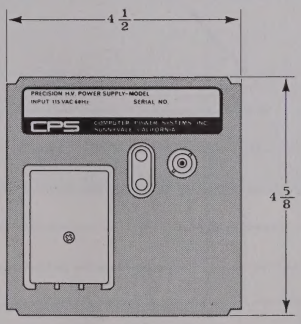
Apply power to the power supply. After warm-up measure the output voltage using method outlined in Section 2-5. To calibrate, adjust potentiometer to desired voltage. If more than 10% adjustment is required, it may be necessary to change the value of R_1 (R_4) and R_2 (R_5) respectively, using the formula described in Section 2-4.

3.2 USE OF H.V. MONITOR JACKS:

PURPOSE:

The Monitor Jacks are located on the front of the power supply (see Fig. 14) and are intended to be used as a rough measurement of the output voltage of the supply by measuring current. See the power supply test data for scale factor (uA/kV). Typical output is 28 to 30uA for maximum voltage output. A 50uA meter, with a maximum resistance of 5Kohms is commonly used.

The meter drive may be trimmed by use of a resistor located in a well in the output block. (see Fig. 15).



FRONT

Fig. 14

H.V. OUTPUT BLOCK

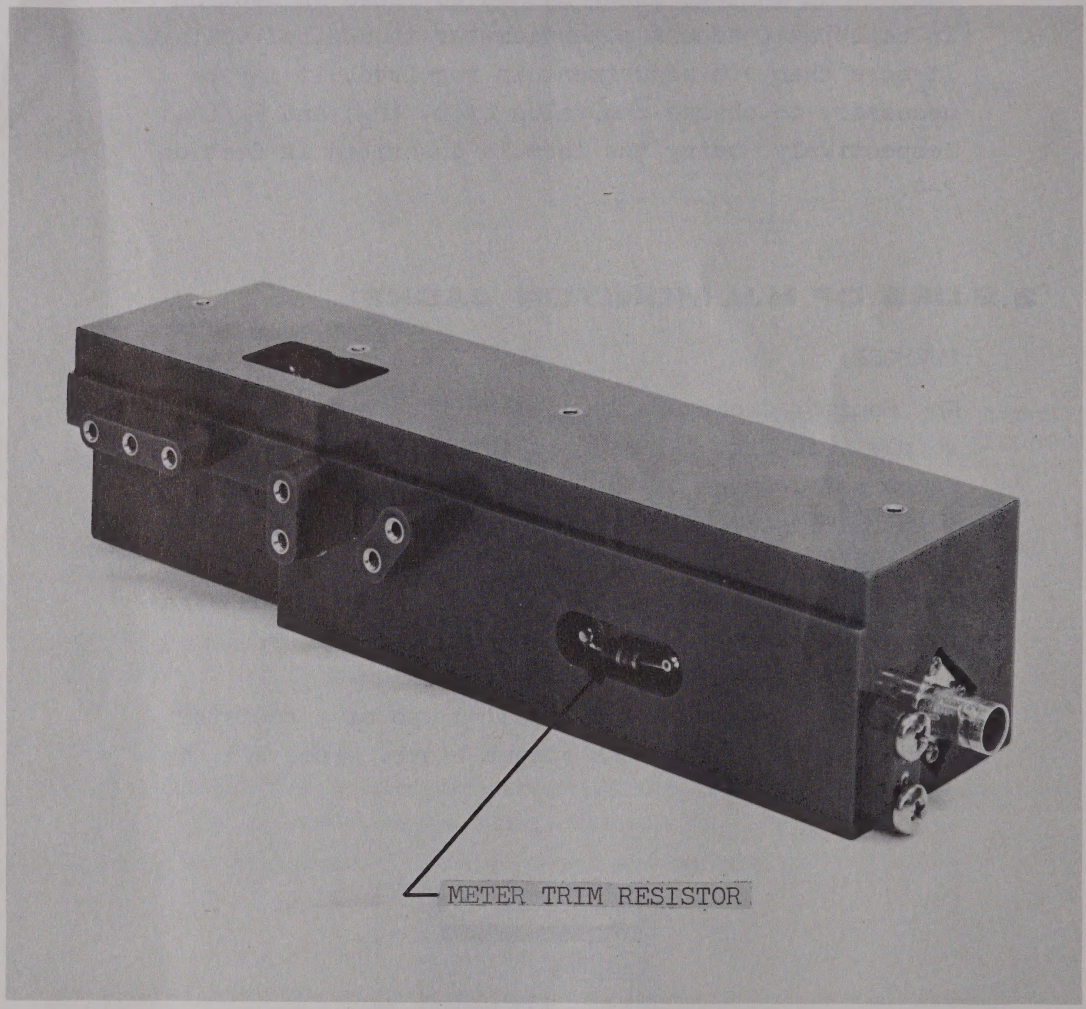


Fig. 15

SECTION 4

CIRCUIT DESCRIPTION

	H.V. OUTPUT MODULE		AUX. TRANSFORMER MODULE	LOW VOLTAGE BD. ASS'Y				POWER TRANSISTORS	METER TRIM RESISTOR	POTENTIOMETER	PROGRAM RESISTORS	FUSE			
NO OUTPUT	4		6	3				2		7	5	1			
LOW OUTPUT	3		6	1				5		4	2				
HI OUTPUT	2		5	1						4	3				
EXCESSIVE RIPPLE	2		6	1				3		5	4				
POOR LINE REGULATION	3		4	1				2							
POOR LOAD REGULATION	3		4	1				2							
MONITOR JACKS INOPERATIVE									1						
METER EXCESSIVE SWING	2								1						
POOR TEMP TRACK	2			1						3	4				
SHORT CIRCUIT PROTECTION DOES NOT WORK				1											
POOR STABILITY	2			1				5		3	4				
OSCILLATION	4			1				2		3					

4.1 TROUBLE SHOOTING CHART

WARRANTY

Seller (CPS, Inc.) warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent CPS equipment, or an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) the defective equipment is returned to Seller, transportation charges prepaid by Buyer, and (c) Seller's examination of such equipment discloses to its satisfaction that defects were not caused by negligence, misuse, improper installation, accident or unauthorized repair or alteration by the Buyer.

This warranty is applicable to the original Buyer only and constitutes the sole and exclusive warranty of Seller. No other warranty is made, expressed or implied.

CPS, Inc.

CPS

DR. Frederick Quidley	4-29-70
CKD. W Dinner	4-30-70
APV.	

LIST OF REPLACEABLE PARTS

MODEL '2000' SERIES

REV	DESCRIPTION	DR	APV

P/L

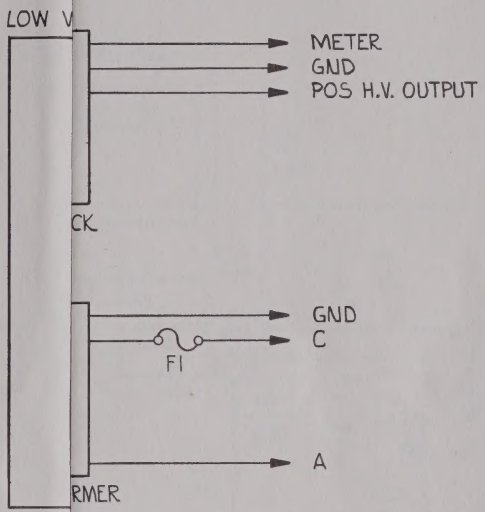
QTY	PART NO	MGF	DESCRIPTION	ITEM
1	2020-17-005		ASSY CHASSIS	1
1	2020-38-002		ASSY MOTHER BOARD DUAL	2
1	2020-38-006		ASSY MOTHER BOARD NEG	3
1	2020-38-008		ASSY MOTHER BOARD POS	4
1	2020-13-001		EXTRUSION, BOTTOM	5
1	2020-13-002		EXTRUSION, TOP	6
1	2020-17-001		CENTER PLATE	7
1	1200-14-001		BACK PANEL	8
1	1200-17-001		WRAP AROUND	9
7	0000-25-204		SCREW PAN HD 6 32 X 3/16	10
1	1200-01-001		ASSY AUXILIARY TRANSFORMER	11
1	2020-01-001		ASSY H.V. TRANSFORMER POS	12
1	2020-01-002		ASSY H.V. TRANSFORMER NEG	13
1	2000-35-010		ASSY H.V. OUTPUT POS 3KV	14
1	2000-35-013		ASSY H.V. OUTPUT POS 5KV	15
1	2000-35-015		ASSY H.V. OUTPUT NEG 5KV	16
1	2000-35-024		ASSY H V OUTPUT POS 2KV	17
1	2000-39-008		ASSY L V POS	18
1	2000-39-010		ASSY L V NEG	19

P/L

QTY	PART NO	MGF	DESCRIPTION	ITEM
4	0000-25-210		SCREW, FLAT HD. 6-32 X 1/2	20
1	0000-25-104		SCREW, PAN HD. 4-40 X 1/4	21
1	0000-25-275		NUT, KEP 6-32	22
2	0000-25-251		WASHER, FLAT #6	23
7	0000-25-250		LOCKWASHER, INT. TOOTH #6	24
2	0000-25-252		LOCKWASHER, SPLIT RING #6	25
1	0000-99-003		"L" BRACKET	26
1	0000-08-001		FUSE, 1 1/2 AMP	27
1	1200-16-004		FUSE COVER	28
2	000C-06-025		CONNECTOR, HVC-10	29
2	0000-25-206		SCREW PAN HD 6-32 X 3/8	30
11	0000-25-207		SCREW FLAT HD 6-32 X 3/8	31
		OPTION 'R'	ONLY	
1	0000-06-023		CONNECTOR, AMPHENOL	32
1	2000-13-023		EXTRUSION, TOP	33
REF	2000-00-008		SCHEMATIC, OPTION "R"	34

P/L

REVISIONS		
DESCRIPTION	DATE	APPROVED
REVISED & REDRAWN		



RIPTION	CODE IDENT	PART OR IDENT NO.	SPEC	FIND NO.

PARTS LIST

CPS, INC.
722 East Evelyn Avenue
Sunnyvale, California 94086
(408) 738-0530

1-15-73 DATE

-22-73 DATE

DATE

DATE

DATE

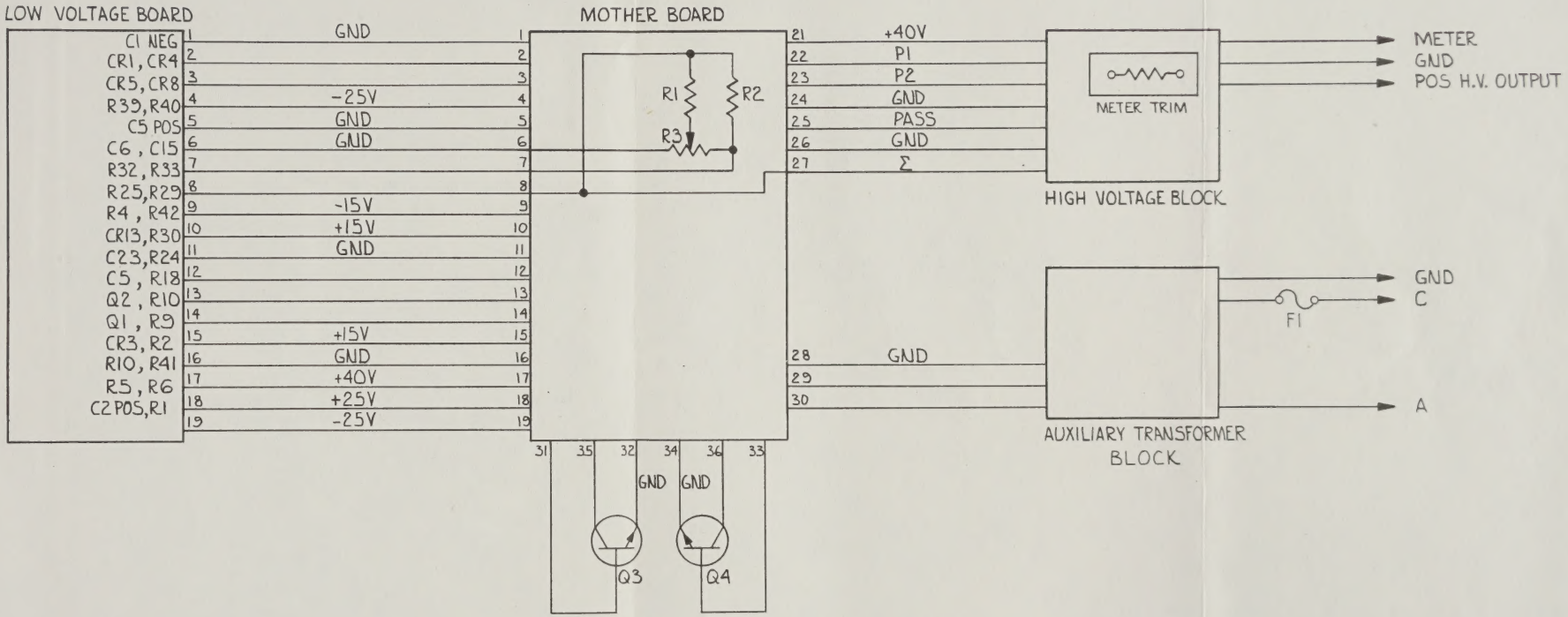
TITLE

BLOCK DIAGRAM,
MODEL 2000 POS

SIZE	CODE IDENT NO.	
C	31640	2000-00-007 A

SCALE ~ WEIGHT ~ SHEET 1 OF 1

REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
A		REVISED & REDRAWN		



-5	-4	-3	-2	-1	NOMENCLATURE OR DESCRIPTION	CODE IDENT	PART OR IDENT NO.	SPEC	FIND NO.
QTY REQD PER DASH NO.					PARTS LIST				

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FRACTIONS ± ____ ANGLES ± ____
DECIMALS
2 PLACES ± ____ 3 PLACES ± ____
CONCENTRICITY TIR
SURFACE ROUGHNESS ✓

HEAT TREAT

MATERIAL:

CONTRACT NO.		
PREPARED	1-15-73	DATE
CHECKED	1-22-73	DATE
APPROVED		DATE
APPROVED		DATE
APPROVED		DATE

CPS INC.
722 East Evelyn Avenue
Sunnyvale, California 94086
(408) 738-0530

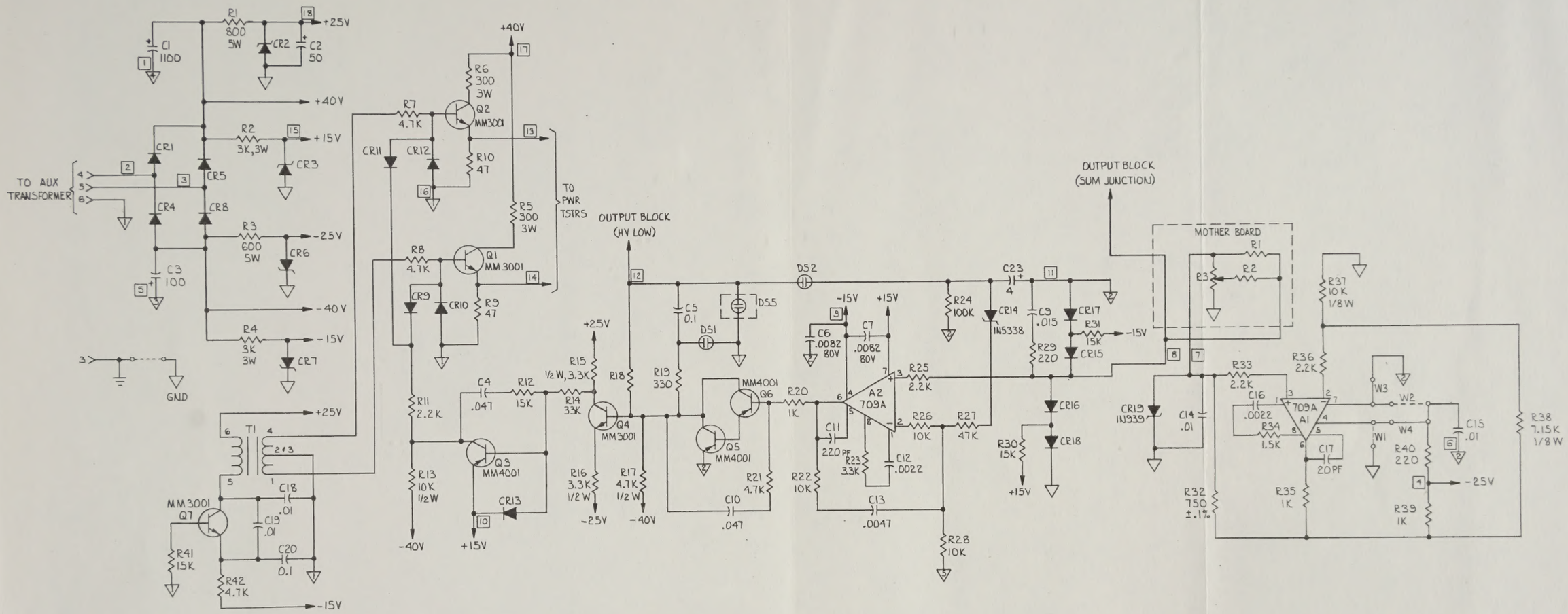
TITLE
BLOCK DIAGRAM,
MODEL 2000 POS

2000	–
PROJECT	NUMBER
NEXT ASSEMBLY	
APPLICATION	

SIZE	CODE IDENT NO.	
C	31640	2000-00-007 A

SCALE ~ WEIGHT ~ SHEET OF

REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
C		REVISED CFD		



NOTES: (UNLESS OTHERWISE NOTED)

1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%
2. ALL DIODES ARE SCE-2
3. ALL CAPACITOR VALUES ARE IN MICRO FARADS
4. VOLTAGE OUTPUT PINS ARE AS FOLLOWS:

+15V	PIN 15
-15V	PIN 9
+25V	PIN 18
-25V	PIN 4
+40V	PIN 17
-40V	
GND	PIN 1 PIN5 PIN6 PIN11 PIN16

-5	-4	-3	-2	-1	NOMENCLATURE OR DESCRIPTION	CODE IDENT	PART OR IDENT NO.	SPEC	FIND NO.
QTY REQD PER DASH NO.					PARTS LIST				

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FRACTIONS ± ____ ANGLES ± ____
DECIMALS
2 PLACES ± ____ 3 PLACES ± ____
CONCENTRICITY TIR
SURFACE ROUGHNESS ✓
HEAT TREAT
MATERIAL:

	CONTRACT NO.	
PREPARED	R Wolfgang	1-11-73 DATE
CHECKED	AGWimmer	1-22-73 DATE
APPROVED		DATE
APPROVED		DATE
APPROVED		DATE

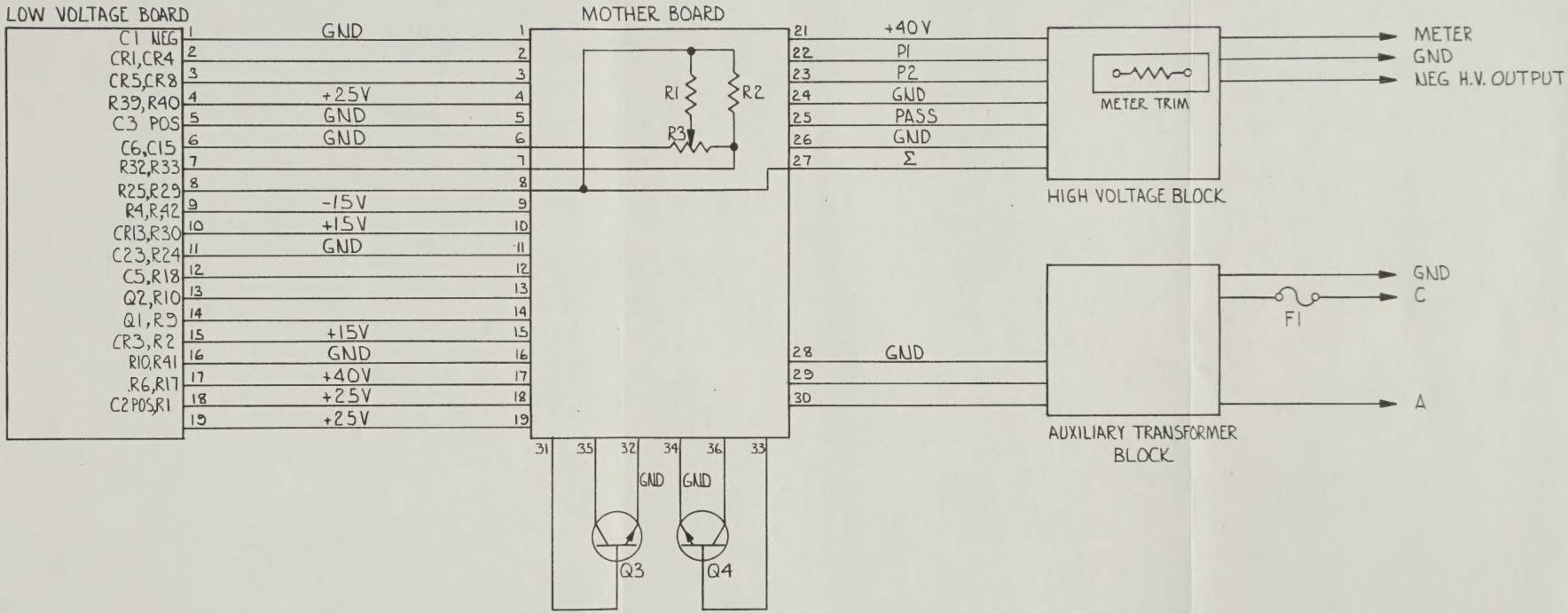
CPS INC. 722 East Evelyn Avenue Sunnyvale, California 94086 (408) 738-0530

TITLE: SCHEMATIC DIAGRAM — LOW VOLTAGE BOARD 2000 SERIES-POS

2000	2000-39-008
PROJECT	NUMBER
NEXT ASSEMBLY	
APPLICATION	

SIZE D | CODE IDENT NO. 31640 | 2000-39-009 C
SCALE — | WEIGHT — | SHEET 1 OF 1

REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
A		REVISED & REDRAWN BW		



-5	-4	-3	-2	-1	NOMENCLATURE OR DESCRIPTION	CODE IDENT	PART OR IDENT NO.	SPEC	FIND NO.
QTY REQD PER DASH NO.					PARTS LIST				

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FRACTIONS ± ____ ANGLES ± ____
DECIMALS
2 PLACES ± ____ 3 PLACES ± ____
CONCENTRICITY TIR
SURFACE ROUGHNESS ✓

HEAT TREAT

MATERIAL:

2000	–
PROJECT	NUMBER
NEXT ASSEMBLY	
APPLICATION	

CONTRACT NO.

BWday	1-15-73
PREPARED	DATE
JAG Wm	1-22-73
CHECKED	DATE
APPROVED	DATE
APPROVED	DATE
APPROVED	DATE

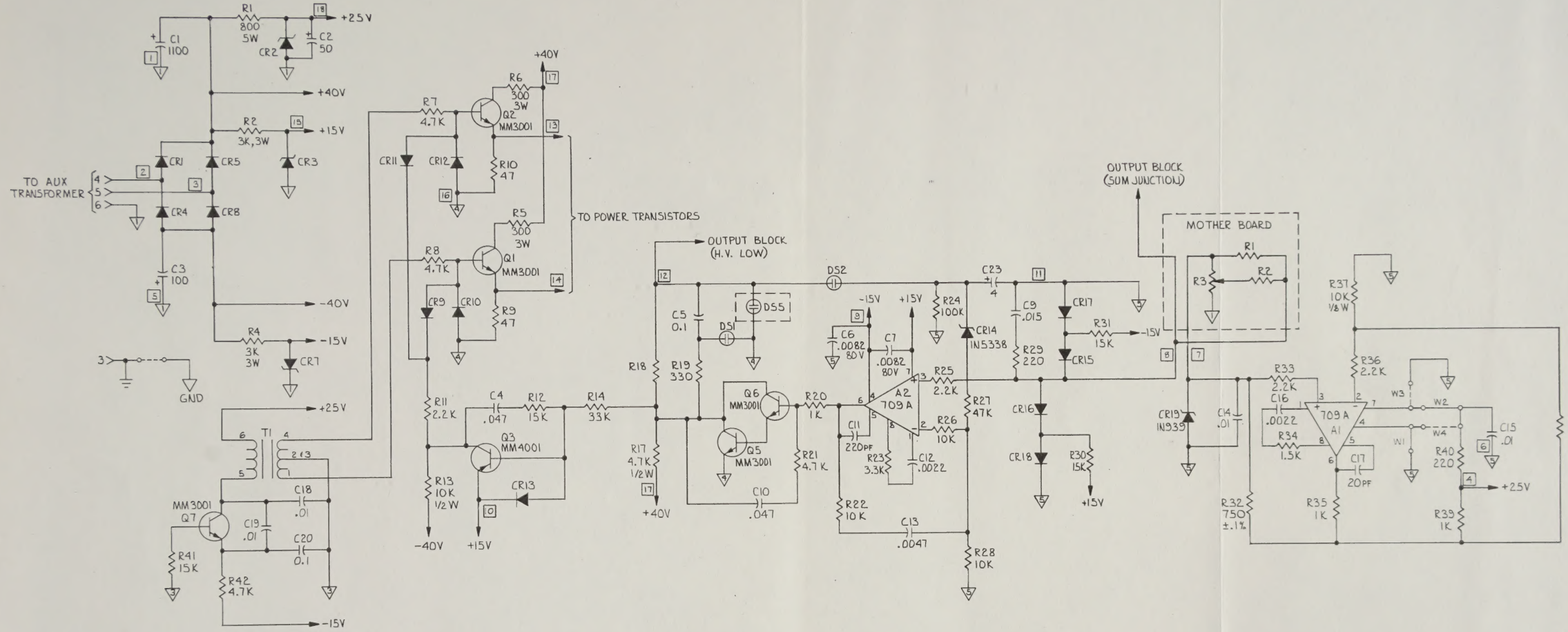
CPS, INC.
722 East Evelyn Avenue
Sunnyvale, California 94086
(408) 738-0530

TITLE
BLOCK DIAGRAM,
MODEL 2000 NEG

SIZE	CODE IDENT NO.	
C	31640	2000-00-006 A

SCALE ~ WEIGHT ~ SHEET 1 or 1

REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
C		REVISED CFP		



NOTES: (UNLESS OTHERWISE NOTED)

1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%
2. ALL DIODES ARE SCE-2
3. ALL CAPACITOR VALUES ARE IN MICRO FARADS
4. VOLTAGE OUTPUT PINS ARE AS FOLLOWS

+15V	PIN 15
-15V	PIN 9
+25V	PIN 18
+25V	PIN 4
+40V	PIN 17
-40V	
GND	PINS 1,5,6,11,16

-5	-4	-3	-2	-1	NOMENCLATURE OR DESCRIPTION	CODE IDENT	PART OR IDENT NO.	SPEC	FIND NO.
QTY REQD PER DASH NO.					PARTS LIST				

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FRACTIONS ± ____ ANGLES ± ____
DECIMALS
2 PLACES ± ____ 3 PLACES ± ____
CONCENTRICITY TIR
SURFACE ROUGHNESS ✓
HEAT TREAT ____
MATERIAL: ____

CONTRACT NO.	
PREPARED	1-12-73 DATE
CHECKED	1-22-73 DATE
APPROVED	DATE
APPROVED	DATE
APPROVED	DATE

OPS INC.
722 East Evelyn Avenue
Sunnyvale, California 94086
(408) 738-0530

TITLE: SCHEMATIC DIAGRAM, LOW VOLTAGE BOARD, 2000 SERIES NEG

2000	2000-39-010
PROJECT	NUMBER
NEXT ASSEMBLY	
APPLICATION	

SIZE	CODE IDENT NO.	
D	31640	2000-39-011 C

SCALE ~ WEIGHT ~ SHEET 1 of 1